

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 13 SEP 2005		2. REPORT TYPE Technical, Success Story		3. DATES COVERED 03-11-2004 to 14-09-2005	
4. TITLE AND SUBTITLE Excalibur Armament Actuator				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER 04-0034-03	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) National Center for Defense Manufacturing & Machining,1600 Technology Way,Latrobe,PA,15650				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT Picatinny Arsenal's Armament Research, Development and Engineering Center's (ARDEC) Prototype Manufacturing Team was tasked with producing prototype parts and a representative production process for the Excalibur 155mm Artillery Projectile. ARDEC personnel started producing the components with existing equipment at their facility. Their initial run time for the bottom plate was 7.5 hours with six (6) different setups and unacceptable variations in part dimensional tolerances. AMRDEC personnel called upon the National Center for Defense Manufacturing and Machining (NCDMM) for their assistance in establishing a more efficient manufacturing process for both the initial prototype parts and to gain insight into the production cycle times and processing methods for higher rate part quantities.					
15. SUBJECT TERMS National Center for Defense Manufacturing and Machining; NCDMM; Picatinny Arsenal; Redstone Aresenal; Excalibur 155mm Artillery Projectile					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT 1	18. NUMBER OF PAGES 1	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

PROBLEM / OBJECTIVE

Picatinny Arsenal's Armament Research, Development and Engineering Center's (ARDEC) Prototype Manufacturing Team was tasked with producing prototype parts and a representative production process for the Excalibur 155mm Artillery Projectile. ARDEC personnel started producing the components with existing equipment at their facility. Their initial run time for the bottom plate was 7.5 hours with six (6) different setups and unacceptable variations in part dimensional tolerances. ARDEC personnel called upon the National Center for Defense Manufacturing and Machining (NCDMM) for their assistance in establishing a more efficient manufacturing process for both the initial prototype parts and to gain insight into the production cycle times and processing methods for higher rate part quantities.

After reviewing the process and machine tools available, the NCDMM recommended the JUMPED™ (Joint Ultimate Manufacturing Process Evolution and Development) process. The JUMPED™ process is a collaborative initiative that leverages the use of the NCDMM Testing and Development Lab for the performance of complete turnkey projects. Through JUMPED™, comprehensive manufacturing processes are completely developed and verified in the NCDMM Lab by integrating advanced manufacturing technologies.



Haas VF-3 machine tool with rotary tilt table (left).
Processed bottom plate (right).



ACCOMPLISHMENTS / PAYOFF

Process Improvement

NCDMM reviewed the component design and determined that because of required tolerances and complex features, 5-axis machining technologies would be required to process these parts efficiently. Modular fixturing was designed to reduce setups. Tailored form tooling with through coolant was designed to effectively machine special features.

CNC programs were developed and optimized to minimize cycle times.

Implementation and Technology Transfer

During this process development the NCDMM engineers determined that a cell-type machine setup would be the most effective and efficient method. The cell method includes several machines placed in an efficient part-flow path. Each machine is dedicated to specific operations and all machines are processed to run under the control of one operator. Three (3) machines were used to demonstrate the benefit of the cell method. The cell included the 5-axis mill already designated for the process, along with a 3-axis mill and 2-axis lathe already consigned to the NCDMM for testing and development purposes.

Following are the results of the NCDMM implemented JUMPED™ process:

- Reduced setups from six (6) to three (3)
- All required tolerances and critical feature characteristics were achieved
- Processing time reduced from 7.5 hours to 1.5 hours
- Utilized new state-of-the-art tooling
- No disruption to daily ARDEC Prototype Lab activities

Expected Benefits

This process will be deployed at ARDEC and other DoD suppliers, resulting in more rapid fielding of this critical system. Expected cost savings are:

- Prototype Build = \$90K
- Low Rate Initial Production = \$5.25M
- Planned Production = \$75M

TIME LINE / MILESTONE

Start Date..... November 04
End Date September 05

PROJECT FUNDING

NCDMM / Picatinny Arsenal (Cost Share)..... \$400K

PARTICIPANTS

BlueSwarf Mfg. Laboratories	Haas Automation Inc.
ChipBLASTER Inc.	Kennametal Inc.
Faro Technologies, Inc.	CGTech / Vericut
Fryer Machine Systems Inc.	Seim Tool Company

For additional information concerning this project, contact the NCDMM at www.ncdmm.org